

Attorney Docket: 843/42636CO  
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: UWE BENZ

Serial No.: NOT YET ASSIGNED

Filed: July 30, 2001

Title: METHOD AND DEVICE FOR CATALYTIC NITROGEN OXIDE  
REDUCTION OF MOTOR VEHICLE EXHAUST

PRELIMINARY AMENDMENT

Box PATENT APPLICATION  
Commissioner for Patents  
Washington, D.C. 20231

Sir:

Please enter the following amendments to the specification,  
claims and abstract prior to the examination of the application.

IN THE CLAIMS:

Please cancel claims 1-25.

Please add new claims 26-45 as follows:

--26. (New) A device for reducing nitrogen oxides in an  
exhaust stream of a motor vehicle via a catalytic reduction,  
comprising:

a nitrogen oxide reduction reactor containing a  
catalyst on which nitrogen oxide reduction of the nitrogen oxides  
in the exhaust stream is performed via the addition of hydrogen;

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a hydrogen generating device arranged on-board said motor vehicle for generating hydrogen, said hydrogen generating device including at least one of a water vapor reformation reactor for water vapor reformation of hydrocarbons and a partial oxidation reactor for partial oxidation of hydrocarbons, said hydrogen generating device being arranged so as not to be in thermal contact with the exhaust stream of the motor vehicle;

an adjustable heating device coupled with at least one of the water vapor reformation reactor for water vapor reformation and the partial oxidation reactor for partial oxidation.

27. (New) The device according to claim 26, wherein said adjustable heating device is an electrical heater.

28. (New) The device according to claim 27, wherein the electrical heater is at least one of a resistance heater and a heating cartridge.

29. (New) The device according to claim 26, wherein said hydrogen generating device includes said water vapor reformation reactor, and further wherein a catalyst in the water vapor reformation reactor contains one of copper and zinc as active components for water vapor reformation.

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30. (New) The device according to claim 26, wherein said hydrogen generating device includes said water vapor reformation reactor, and further wherein the water vapor reformation reactor further comprises an evaporator stage for water vapor reformation, said evaporator stage being located upstream from a main reaction stage in which the water vapor reformation on a catalyst occurs.

31. (New) The device according to claim 26, wherein said hydrogen generating device includes said water vapor reformation reactor, and further comprising an aftertreatment stage located in said water vapor reformation reactor for water vapor reformation downstream from a main reaction stage in which the water vapor reformation on a catalyst occurs,

wherein in said aftertreatment stage one of a CO produced by the main reaction stage is reduced by a shift reaction and a hydrogen yield is increased.

32. (New) The device according to claim 26, wherein said hydrogen generating device includes said water vapor reformation reactor, and further wherein said water vapor reformation reactor for water vapor reformation is a tube having an inside diameter between 5 to 30 mm.

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33. (New) The device according to claim 31, further comprising an evaporation stage for the water vapor reformation reactor, and means for independently heating said evaporation stage, said main reaction stage, and said aftertreatment stage from one another for water vapor reformation.

34. (New) The device according to claim 26, wherein said hydrogen generating device includes said partial oxidation reactor, and further wherein said partial oxidation reactor comprises an evaporator stage for partial oxidation, said evaporator stage being located upstream of a main reaction stage in which partial oxidation on a catalyst occurs.

35. (New) The device according to claim 34, wherein said adjustable heating device includes an electrical heater for heating said evaporator stage of the partial oxidation reactor.

36. (New) The device according to claim 26, wherein said hydrogen generating device includes said partial oxidation reactor, and further comprising a feed device with which product gases produced during said partial oxidation on a catalyst are guided against an outer wall of said partial oxidation reactor.

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37. (New) The device according to claim 34, further comprising a feed device with which product gases produced during said partial oxidation on the catalyst are guided against an outer wall of said partial oxidation reactor.

38. (New) The device according to claim 26, wherein said hydrogen generating device includes said partial oxidation reactor, and further comprising an aftertreatment stage provided in said partial oxidation reactor for partial oxidation downstream from a main reaction stage in which said partial oxidation occurs on a catalyst; and

wherein in said aftertreatment stage one of a produced by the main reaction stage is reduced by a shift reaction and a further reaction with residual hydrocarbons with water vapor occurs.

39. (New) The device according to claim 34, further comprising an aftertreatment stage provided in said partial oxidation reactor for partial oxidation downstream from said main reaction stage in which said partial oxidation occurs on the catalyst; and

wherein in said aftertreatment stage one of a CO produced in the main reaction stage is reduced by a shift

40. (New) The device according to claim 26, wherein said hydrogen generating device includes said partial oxidation reactor, and further wherein said partial oxidation reactor for partial oxidation is a tube having an inside diameter of between 5 to 50 millimeters.

41. (New) The device according to claim 34, wherein said partial oxidation reactor for partial oxidation is a tube having an inside diameter of between 5 to 50 millimeters.

42. (New) The device according to claim 26, wherein said at least one of said partial oxidation reactor for partial oxidation and said water vapor reformation reactor for water vapor reformation is a cylindrical block having a plurality of axial holes, a catalyst thereof being located in at least one of said axial holes and an evaporator stage thereof constituting at least one further of said axial holes.

43. (New) The device according to claim 42, wherein a heating cartridge is located in a central one of said axial holes in said at least one of said partial oxidation reactor for

partial oxidation and said water vapor reformation reactor for water vapor reformation.

44. (New) The device according to claim 26, wherein said hydrogen generating device is a separate module arranged on-board the motor vehicle.

45. (New) A device for reducing nitrogen oxides in an exhaust stream of a motor vehicle via a catalytic reduction, comprising:

a nitrogen oxide reduction reactor containing a catalyst on which nitrogen oxide reduction of the nitrogen oxides in the exhaust stream is performed via the addition of hydrogen;

a hydrogen generating device arranged on-board said motor vehicle for generating hydrogen, said hydrogen generating device including at least one of a water vapor reformation reactor for water vapor reformation of hydrocarbons and a partial oxidation reactor for partial oxidation of hydrocarbons, said hydrogen generating device being a separate module arranged so as not to be in thermal contact with the exhaust stream of the motor vehicle;

an adjustable heating device coupled with at least one of the water vapor reformation reactor for water vapor reformation and the partial oxidation reactor for partial

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oxidation and operating to regulate temperature independently of  
an operating state of the motor vehicle.--

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REMARKS

This is a continuation application of U.S. Application Serial No. 08/585,685 filed January 16, 1996, and presently on appeal.

Original claims 1-25 have been cancelled. New claims 26-45 have been added. These new claims 26-45 correspond to claims 7-13 and 15-27 that were on appeal in the parent application. In other words, parent independent claim 7 corresponds to new independent claim 26 and parent independent claim 27 corresponds to new independent claim 45. These new independent claims 26 and 45 have been clarified to recite that the hydrogen generating device is arranged "so as not to be in thermal contact with" the exhaust stream of the motor vehicle.

In view of the Board's Decision on Appeal dated May 30, 2001 in the parent application, Applicant respectfully submits independent claims 26 and 45 are patentable over the prior art, including European Patent EP 0 537 968 A1 and U.S. Patent No. 1,789,812. In EP '968, the in the form of a reforming catalytic converter 102 is heated via the exhaust gas. By contrast, Applicant's independent claims 26 and 45 are not in thermal contact with the exhaust stream. This has the advantage that the temperature can be regulated flexibly and independently of the operating state of the engine. It also avoids damage to the

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catalyst (deactivation) that can be caused by the constant heating by the exhaust stream while the engine is operated after heating (and overheating). (See page 2, lines 8-18 and page 4, lines 1-12).

In view of these amendments, claims 26 and 45 are not anticipated by EP '968 (See Board Decision). Moreover, they are not rendered obvious by any combination of EP '968 with Frazer, which merely discloses preheating catalyst for subsequent heating by the exhaust gas.

For the foregoing reasons, upon examination, Applicant submits claims 26-45 are in condition for allowance and early notice to that effect is solicited.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in


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fees or credit any overpayments to Deposit Account No. 05-1323

(Docket #843/42636CO) .

Respectfully submitted,

July 30, 2001

  
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